A black and white photograph showing a variety of incandescent light bulbs and fluorescent tubes. The items are scattered across a dark, textured background. There are several standard A-shaped bulbs of different sizes, a large parabolic aluminized reflector (PAR) bulb, a U-shaped bulb, and several long, thin fluorescent tubes. Some of the tubes have their protective sleeves removed, revealing the internal U-shaped filaments. The lighting creates soft shadows, highlighting the different shapes and textures of the bulbs.

MAKING *Light* WORK FOR YOU

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*More and more families are learning the value of good general and local lighting for the comfort and enjoyment of living.*

# MAKING *Light*

## WORK FOR YOU

When farm people seek electricity, uppermost in their minds are the comforts and conveniences that steady, efficient electric light can bring to their homes and farmsteads.

Few people, however, in either city or country, have really adequate light everywhere they need it. The notion still persists that good lighting costs so much more than mediocre lighting that "it's hardly worth the difference—we'll get along with what we have now."

These pages<sup>1</sup> tell the story of effective farm and home lighting—what it is, how it can be obtained, and what it can do to make your farming and living more efficient, safer, and more comfortable.

Whether you are getting electricity for the first time or are adding to your present lighting facilities in your home and on your farm, it is well to remember these points:

Decide what uses you are going to make of your lighting. Go through your

house and plan to place your lights with your family's needs in mind. It's a good idea to make a list of the uses you'll have for *general* lighting, such as that usually provided by overhead fixtures. You should also list those jobs which need more light to be provided by lamps or nearby fixtures. That gives you a good start on a lighting plan to be considered when your wiring is done.

Consider *how much* light you need to carry on your jobs on the farm and in the home. The partial list of the bulb sizes on pages 8 and 15 will help you in this. Make sure you have enough light.

Consider *what kind* of fixtures and lamps you will need for various tasks.

Remember these key elements of good lighting—where, how much, and what kind.

### *This Business of Seeing*

Scientists estimate that we get about 87 percent of our impressions through our eyes. So it is really important that

<sup>1</sup> Revised reprinting of article in *Rural Electrification News*, August–September 1947.

we get enough of the right kind of light for all our seeing tasks.

Many of us skip lightly over this business of seeing. About half the population suffers from eye defects, of some kind. Many of these defects are caused by eyestrain—from asking the eyes to adapt themselves to inadequate light.

Although lack of proper light is the biggest single factor in eyestrain, it is also, luckily, the easiest to control. We know enough about our eyes now and about the kind of light we need to eliminate this hazard to good seeing.

And it is a hazard. Teachers will tell you that many children who seem listless, backward, and lazy, and who tire easily, simply lack adequate light in their classrooms. You may have noticed the same thing when Johnny tried to study evenings under the oil lamp. Dim or glaring light was robbing him of his sight and of his chance to learn.

Oddly enough, the same thing can happen and is happening to thousands of Johnnies and their brothers, sisters, and parents who have electric service but who try to read, sew, wash, and do other work in light that is either too dim or the wrong kind. They plump themselves down to read the local paper under a small desk lamp that throws a bright, but glaring spot on their page; they try to do careful, painstaking work such as sewing in light that was meant only for tasks requiring little seeing.

Light can be measured, just as you can measure objects that can be touched and weighed. A delicate instrument, a light meter, measures the amount of light available at a given point, such as on the paper you are reading. The amount of light is registered in foot-candles. A foot-candle is the amount of light at a point a foot away from a lighted standard candle.

Not every home need buy an expensive light meter. But if you can borrow one from your co-op, county agent, or electric equipment supply store, it would be helpful as well as interesting to see how much light your present lighting really gives you, and how

much more you would need to have adequate light by correct standards. Place the light meter in the location where your work is naturally done, and at the angle at which the book or work is held.

On a sunny day outdoors, the needle on the light meter will jump clear to the top of the dial. And well it might, for the intensity of sunlight may reach 10,000 foot-candles. In contrast, the recommended minimum amount of light for general lighting—for sitting, walking about, etc.—in your home at night is about 5 foot-candles. Many homes have even less than the 5-foot-candle minimum. Of course, the amount of light at places where you do various jobs, should be much higher, depending on what the work is. For example, rough kitchen work takes about 10 foot-candles; sewing on black goods takes about ten times as much as this.

### *How To Get More Light*

There are many ways in which you can increase the amount of light you need for various jobs. The most obvious

*Plenty of light at the dressing table is an aid to good appearance.*





way, of course, is simply to put larger bulbs in your present light sockets.

Take a look at the list of bulb sizes on page 15. You may be surprised at how much difference there is between the size of the bulb that has been found to be adequate for various tasks, and the size of the bulb which you actually have been using. You may also be surprised at how little it costs to use larger bulbs. It is more efficient, also, to use large bulbs instead of several small ones of the same total wattage. It takes the light output of six 25-watt bulbs to equal the light of a 100-watt bulb.

Another major way in which you can increase available light is to increase the amount of light reflected from your walls and ceilings. The main point to remember is that dark colors absorb light and light colors reflect it. Many homemakers will find that they can brighten up their rooms enormously simply by resurfacing or repainting in a lighter color.

#### *Cleaning Helps, Too*

Homemakers who find it difficult to refinish their walls or ceilings will find

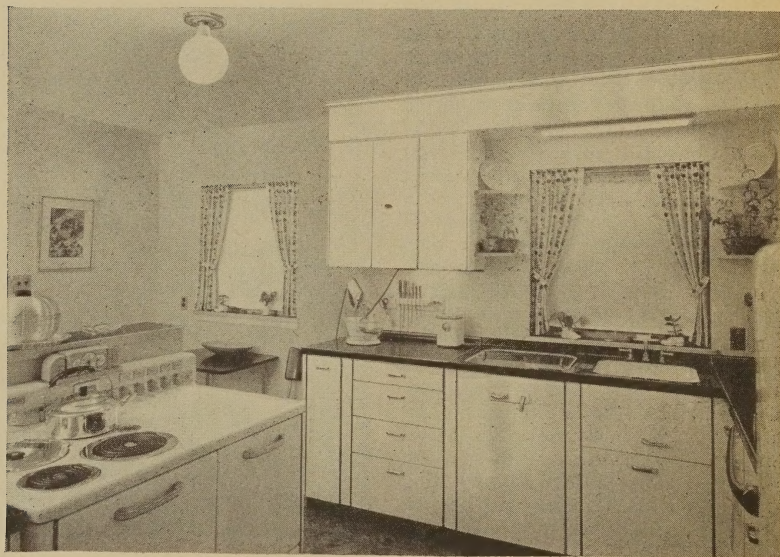
that they can increase the amount of usable light by cleaning walls, ceilings, lamp fixtures, and bulbs regularly. Dirt and dust absorb light.

While dusting and cleaning, it's a good idea to look at the lamps and shades themselves, as well as the dust on them! If shades are of dark color inside, you are wasting light. Try using paint or white shoe polish to lighten them. Be sure to let the shade dry before using light. Also, wide flaring shades allow more light to be reflected than the area where it is to be used than narrow ones with straight sides.

#### *Check Height of Lamps*

The height and placing of your lamps has a direct bearing on the amount of light they give out. A short floor lamp is better than a tall one because the light source will be nearer the page or other material to be lighted. However, height is an advantage in table lamps. The shade of a very short table lamp will cut off light, rather than spread it out over the area to be lighted. So choose table lamps that are high enough to give a wide lighted area.

*Modern kitchen planning calls for plenty of light from overhead, plus local light for jobs such as dishwashing and cooking.*







## Get the RIGHT KIND OF LIGHT

As we have seen, you must have *enough* light. You also need light of good quality to insure comfort, safety, and satisfaction for every member of the household, wherever he or she uses light in the home or on the farm.

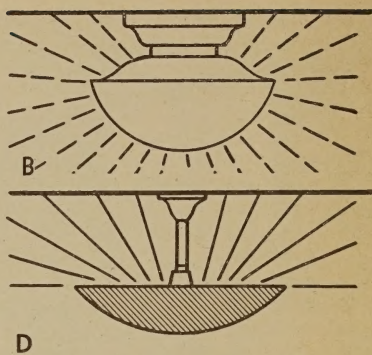
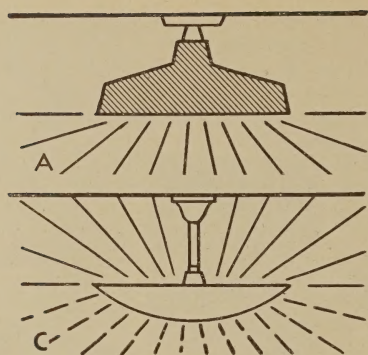
The main characteristic of good-quality light is the extent of its freedom from glare and harsh shadows.

### *Freedom From Glare*

Glare is one of the worst enemies of good seeing. We know how our eyes ache when we try to read or do other close-seeing work in strong sunlight.

Even though the sun may give a tremendous *quantity* of light it may be too glaring for effective close work. Also, intense sunlight on a light surface like a printed page contrasts too strongly with the lower level of light around the page. For the same reasons, our eyes ache and strain when we try to read or do other work for any length of time in the light of a bare electric bulb.

Direct glare from bare bulbs is not the only hazard to good seeing. *Reflected* glare is caused by light falling on shiny surfaces from which it is reflected into the eyes. Shiny walls, mirrors, glass, or metal objects, or even



glossy paper may reflect glaring light into the eyes.

Bare bulbs and poorly shaded bulbs tend to create harsh shadows—another cause of eyestrain.

Both glare and harsh shadows can be eliminated by the proper use of indirect fixtures or fixtures of translucent material that diffuse the light or that redirect the light.

The accompanying sketches show how ceiling fixtures of different types diffuse or redirect light. Sketch A shows a fixture that throws *direct* light, reflected downward only. This kind of fixture may be used over tool benches in a farm workshop or in other places where you need a large amount of light but do not require light for long periods on fine details, and where you need not look at the light source.

Sketch B shows a *semidirect* type fixture, from which light is diffused evenly in all directions. (A similar type is known as a “general diffuse” fixture.) The enclosing opal glass globes commonly used for incandescent fixtures in kitchens, bathrooms, and porches are good examples of these types. They should be placed well above eye level.

Sketch C shows a *semi-indirect* type of fixture combining features of the semidirect and indirect. This type directs most of the light to the ceiling for reflection, but some is diffused through the bottom of the bowl. It is an excellent type for inexpensive and pleasing

light. Again, it should be above the line of vision.

Sketch D shows an *indirect* type fixture, from which nearly all light is directed to the ceiling, where it is redistributed or reflected throughout the room. You get fewer shadows from this type of fixture than from any other, but it also gives less light than other types for the same wattage.

Glare and shadows from bulbs in portable lamps are reduced by the use of diffusing reflectors of glass or plastic. These reflectors, under the shades of portable lamps, diffuse the light through the whole area of the bowl. This softens shadows and makes the light easy on the eyes. On page 9 are illustrations of some good types of lamps using diffusing bowls.

Light can also be diffused by reflecting it against the walls, ceilings, and lamp shades, with dull finishes instead of shiny surfaces. Glare can be eliminated, too, by changing the location of the reflecting object, such as a piece of paper or shiny furniture. Or it may be eliminated by changing the position of the lamp, or of the worker or his work.

### *Well-Distributed Light*

Another shadowy condition that causes eyestrain results when there are sharp contrasts in the levels of light in a room. Suppose you are reading in the bright light of a floor lamp—the pages of your book are flooded with light.



From time to time you glance up from your reading. If only the area around the lamp is well-lighted, the sharp contrast between light and darkness will strain your eyes, because they must adjust constantly to great differences in light intensity.

That is why it is best to use a ceiling light for general lighting, and to use lamps for local light where reading or other close-seeing work is to be done. A good rule to follow is to have at least one-tenth as much general illumination

in the room as is needed on the specific task.

Instead of a ceiling light, it may be possible—and more pleasant though also more expensive—to use *indirect* or *semi-indirect* floor lamps to give general illumination. There must be enough of these lamps, each giving enough light and light of good quality to light all dark areas in the room. The lamps should be tall enough, or have a diffusing bowl of special design, to prevent glare from the bulb.

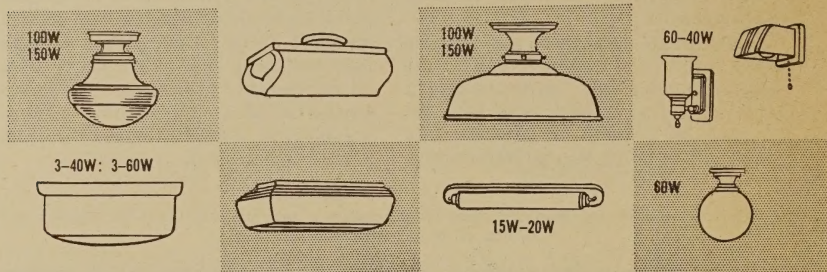
*Proper use of diffusing bowls in these lamps creates a soft, pleasant light for reading and sitting, as well as some general light.*



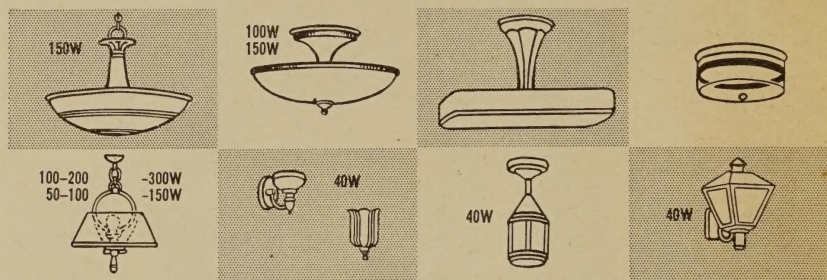


# WHAT TYPES OF FIXTURES ARE

## FOR WORK AREAS



## FOR LIVING AREAS



Good electrical fixtures are important in home and farm lighting. It's wise to buy simple inconspicuous fixtures, if money is limited, and put more money in portable lamps.

On this page are shown some of the types of fixtures commonly used and recommended for various places in your home. Fixtures of different types serve two main purposes. Ceiling fixtures provide good general lighting, and are easily controlled by a single-pole switch or three-way wall switches at the most frequently used entrances to a room. Wall fixtures serve to light particular areas in your rooms. Good fixtures serve to spread and diffuse light.

The diameter of ceiling fixtures should correspond in inches to the width of the room in feet. There should be a relationship also between the di-

ameter of the fixture in inches and the wattage of the incandescent lamp bulb used in the fixture. (See recommended bulb sizes in chart above and on p. 15.) Too large a bulb for the fixture size will produce objectionable brightness; too small a bulb will produce too little light.

Portable lamps are an essential feature of good lighting. You will want to select lamps that are in harmony with your other furnishings. But first, you will want to have in mind their lighting qualities and your family's "seeing" needs.

The main purpose of a portable lamp, whether on floor, on wall, on table or on another piece of furniture, is to bring more light to the places where it is needed. The light source should be not more than 36 inches from the object



# D LAMPS?

to be lighted, such as the book being read. Less than 36 inches is better.

A table lamp should be placed on the edge of the table near the chair, or toward the rear of the chair behind the shoulder of the person reading, rather than directly behind his head. For writing, the lamp should be placed to throw light over the shoulder opposite the writing hand of the person.

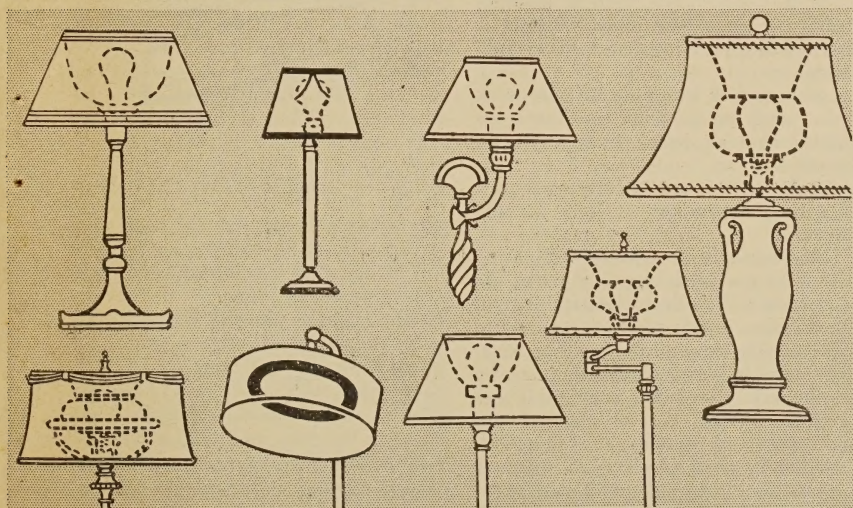
Proper grouping of sofas, tables, etc., can permit several persons to use the same light source. However, this can only be done when there is light enough to serve all users adequately.

There should be a close relationship between the diameter of the diffusing bowl in a floor or table lamp, and the size of the incandescent bulb used. A 6-inch diameter bowl, for example, should be used with a 75-watt bulb; an 8-inch bowl with a 100-watt bulb; a 9 $\frac{3}{8}$ -inch bowl with a 150-watt bulb, and a 10-inch bowl with a 100-, 200-, and 300-watt bulb. The 7-inch bowl is designed for a 50-, 100-, and 150-watt

bulb, and the 9-inch bowl for a 100-, 200-, and 300-watt bulb.

Lamp shades should be wide and flaring instead of narrow and straight, to permit wider distribution of light. Shade linings should be white for maximum reflection of light. For best lighting distribution, diameters of the shades at the bottom should be about as follows: Table lamps, 14-16 inches; floor lamps, 18-20 inches; bridge lamps, 12-14 inches; swing-arm lamps, 14-16 inches; pin-to-wall lamps, 10-14 inches; dresser lamps, 8-10 inches.

Certified lamps and fixtures—certified to give good lighting and tagged so a buyer can recognize them—are on the market. The reading lamps have a glass and metal cuspidor-shaped bowl, as shown below. Fixtures will be marked to show the lamp size or sizes to be used, and proper hanging heights or range of heights. If a fixture is for a small room, it will be marked "For Rooms of 60 Sq. Ft. Or Less". If it is for "Studying, Reading or Writing," it will have this information on it.





# LIGHTING THE FARM

Good lighting is as important to safety and efficiency on the farm as it is in the home. And, as in the home, good farmstead lighting should be planned from the start to be most effective.

Barn and outbuilding lighting need not be expensive. However, a small bare bulb on a drop cord in each space to be lighted—too common in farm buildings—is of little more value than an oil lantern, except for its greater safety.

Most barnyard jobs can use *direct* light, all reflected downward on the place to be lighted. This can best be done by use of standard-dome and shallow-dome reflectors (right). The shallow-dome type (C) is most practical in larger, wider spaces, while the standard-dome reflector (D) is effective in reducing glare. Deep bowl (A) and angle (B) reflectors can also be used in special cases.

Work for which artificial light is needed in and around farm buildings may be divided into four classes:

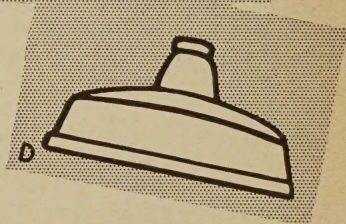
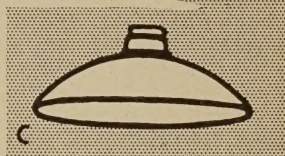
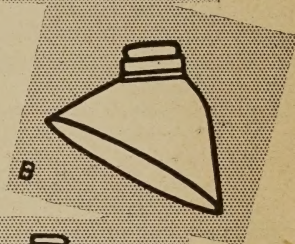
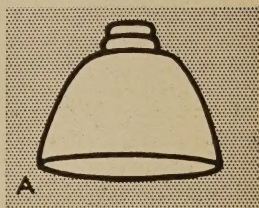
1. Regular chores, such as feeding, cleaning stables, etc.

2. Regular chores, such as washing milk utensils, where plenty of light is needed to permit inspection for cleanliness.

3. Seasonal, irregular, or emergency jobs, such as grading fruit or vegetables, care of sick animals, repair of machinery.

4. Farmshop and work areas requiring large quantities of light for the worker.

The same fundamentals of lighting apply to the farm buildings as to the farm home. The first essential of light in the barn is that a person may see to move safely through the building without stumbling over objects that may be in the way. The second essential is that animals should not be alarmed unnecessarily by moving shadows, with attendant risk of accidents or impaired production. Adequate, well-distributed *general* lighting, including lamps with



reflectors at cross alleys, hay chutes, ladders and stairways, is needed to meet these primary requirements.

Lights in the farmyard are a great aid in doing chores before sunup and after sundown during the winter months. One or more of the poles that carry the wiring system may also serve as supports for yard lights. These lights should be at least 15 feet from the ground, so that their direct rays will not shine in the eyes, and so that the light will be shed over a wide area. High-placed lighting units will also shorten shadows and may reduce the number



of units necessary to obtain maximum lighting efficiency.

If possible, the yard light should be located so that it will light the house entrance and all the paths between the house and other buildings.

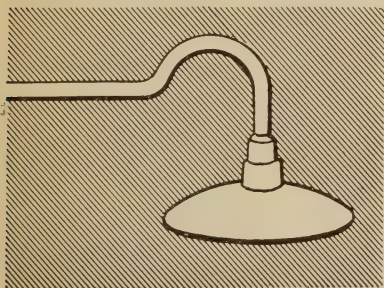
All outdoor lights should be equipped with weatherproof reflectors and porcelain lamp holders to prevent water getting into the socket and to reduce possible breakage of bulbs from rain or hail. Reflectors usually are made of metal finished with white porcelain inside, or of aluminum with polished or oxidized inside finish. (Below.)

Some bulbs are made with the reflecting surface built into the bulb. These can be used as floodlights or spotlights, and eliminate the necessity for a large reflecting fixture. Because of their high reflective qualities, they can be of lower wattage than direct ray lights.

As a rule, however, bulbs of at least 200-watt size are needed for use outdoors, and allowance should be made for using larger bulbs later, if experience should show the need for them.

The following suggestions may prove helpful in providing adequate illumination for the performance of chores.

**Dairy Barn.** Good illumination is of prime importance in the dairy barn because of the need for cleanliness in the production of sanitary milk, in maintaining the health of the animals, and in keeping down the bacteria count in milk. Lamps should be mounted at the ceiling and not farther apart than  $1\frac{1}{2}$  times their height from the floor. In an ordinary dairy barn, this means



that the light fixtures will be from 10 to 12 feet apart, or one light at every third stall. In these fixtures, 60- to 100-watt bulbs should be used.

**Milk House.** Good light in the milk-room and washrooms promotes the cleanliness important in producing high-quality milk of low bacteria count. In a small room, a single 100-watt, inside-frosted bulb in an enclosing globe or reflector, or two 20-watt fluorescent tubes mounted at the ceiling and placed over the sink, will provide good illumination for careful inspection of utensils. In larger rooms, two or more lighting units may be necessary.

**Horse Stable.** The horse stable should be sufficiently lighted so that a horse is not surprised by being approached suddenly. A single guarded light of 60 watts or more, mounted at the ceiling, is needed for each pair of box stalls.

**Sheep Barn.** In sheep barns 30 to 32 feet wide, a single row of lights, centrally located, will usually be sufficient. If the beams or cross beams mark off the ceiling into sections or bays, these may be well lighted by one unit with a reflector mounted at the ceiling in the center of each bay.

A 60-watt bulb will be suitable for a section approximately 12 feet square.

**Hog House.** Light is needed in the hog house mainly for feeding and cleaning. In the usual low-roof structure, lamps equipped with reflectors mounted as high as is practicable along the center alley give good lighting. Sixty-watt lamps may be placed over each pair of pens. Or, if a single pen extends more than 8 feet, one unit per pen may be used.

**Poultry House.** Hen-house lighting in fall and winter seasons enables producers to take advantage of high seasonal egg prices. Forty-watt lamps fitted with reflectors and hung about 6 feet from the floor should be used. Plan for 1 watt of lighting per 5 square feet of floor area.

**Hayloft.** Lights in the hayloft are necessary for convenience and safety. They should be placed in a high, pro-



tected position, but should also be accessible for cleaning and replacing bulbs. Bulbs should be enclosed in a dust-tight fixture to prevent dust explosions in case of lamp breakage. These safety devices should always be used in lofts and feed rooms. Shielded light should be provided over chutes and stairways.

**Farm Shop.** Shop-lighting requirements vary. Night repairs on tractor,

truck, or farm machinery will require 100-watt bulbs, in reflectors, placed at the ceiling or 10 feet above the ground at 10- to 12-foot intervals. Adequate light should also be provided over the workbench. This light sometimes becomes part of the general lighting. A heavy rubber extension cord with a 50-watt rough service lamp equipped with reflector or shade and guard should also be available.

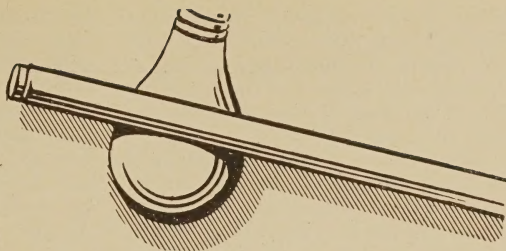
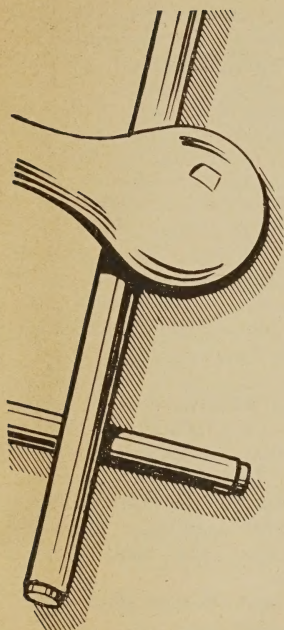
*Lights well spaced in this dairy barn give plenty of illumination for milking and for general cleanliness.*



*This farmer uses a light in his silo to help him handle his feeding operations.*







## FLUORESCENT or INCANDESCENT?

There are two main ways of producing light with electricity. One, with which most users are more familiar, is to pass an electric current through a fine wire filament in a bulb from which air has been removed. This lamp is known as an incandescent bulb—the kind which we screw into a socket to get light.

Incandescent bulbs are made in a wide variety of wattages. They also come with bases of different sizes. The ordinary light bulb in household and farm use has a standard, or medium base. Some three-light bulbs, usually found in 100-, 200-, and 300-watt size, have larger or mogul bases. There are also smaller bases for very small lamps used to light radio dials, Christmas-tree lights, and night-lighting fixtures.

The second way of producing light with electricity is with fluorescent tubes. The most common lamp of this type is the straight tubular one, but circular fluorescent lamps are also sold.

In a fluorescent tube, electricity is discharged through a mercury vapor. This action on the mercury produces

invisible ultraviolet rays. These, in turn, are changed to visible rays by fluorescent materials coating the inside of the tube.

The pronged ends or pins of fluorescent tubes slip, rather than screw, into specially made sockets. Tubes are of varying lengths and diameters according to their wattage, and must be selected to fit the fixtures for which they are intended.

An advantage of fluorescent lighting is that the output of light from a fluorescent tube is between two and three times as much as from an incandescent bulb using the same number of watts. Thus, in one respect you are buying cheaper light with fluorescent tubes. In certain respects you are also buying better light. Fluorescent tubes need less shielding to protect your eyes from their direct glow than incandescent. For most purposes light from either fluorescent tubes or incandescent bulbs should be shaded. However, unshielded fluorescent tubes throw softer shadows and their reflections are not as glaring as

those from unshielded incandescent lamps. Finally, fluorescent lamps usually last two to three times as long as incandescent bulbs. But their burning life is shortened if they are turned on and off frequently.

While fluorescent lighting equipment is usually cheaper to operate than incandescent, its fixtures and lamps generally cost more. In purchasing fluorescent lighting equipment it is important to get equipment of good quality. You might also consult with your co-op manager, adviser, or co-op electrical inspector before buying. That way you should be able to avoid some of the disadvantages of low-quality equipment—bad starting, slight humming noise in operation, occasional flicker and effect on radio reception.

Select fixtures that are easy to clean and in which tubes can be easily replaced. Also, in selecting ceiling fixtures look for those with plastic or glass ends. In some installations metal ends

may produce harsh shadows. Also, give preference to two-tube or multiple-tube ceiling fixtures. These will give you more and better lighting.

Fluorescent lights are popular for many locations where a white light more similar to daylight than that from incandescent lamps, is desired. There are several hues of near-white light obtainable in fluorescent tubes. That known as "soft white" is the warmest, most flattering fluorescent color for general living purposes. The tubes known simply as "white" and daylight are best for workrooms.

In home decoration, it is well to remember that white and daylight fluorescent tubes cast a light that emphasizes the cool colors, blues and greens, in wallpaper, furniture coverings and other furnishings. In contrast, incandescent lights emphasizes the warm colors, yellows and reds, in such decorations.

UNITED STATES DEPARTMENT OF AGRICULTURE  
RURAL ELECTRIFICATION ADMINISTRATION

Washington 25, D. C.



# **SELECT THESE BULBS AND TUBE SIZES TO FIT YOUR LAMP NEEDS**

How to use this list: Check the points in your home and on your farm at which you will need bulbs and tubes, not only now but for replacements. Before you buy, fill in the blanks in the list with the number you will need.

## **Incandescent bulbs:**

- 200-watt for ceiling fixture in kitchen, workroom, library or any large room using indirect fixture; also in yard lights.
- 150-watt for ceiling fixture in kitchen, workroom, dining room, living room. Widely used in reading lamps.
- 100-watt for ceiling fixture in bedroom, small kitchen, large bathroom, breakfast room or dinette. Also used in table and wall reading lamps; farm shops and barn stalls.
- 75-watt for bathroom and hall-ceiling fixture; wall lamps.
- 60-watt on porches, stairways, in closets, in bracket or 3- to 5-lamp cluster fixture; at mirrors, over work spaces.
- 40-watt in 5-lamp cluster fixture, in small bracket fixtures; at all places where 60's are used; also in poultry lighting.
- 25-watt in decorative lamps; in thin-glass brackets or cluster-fixture bowls where 40's or 60's are uncomfortably bright.
- Three to 15 watts for night lights.

## **Three-light incandescent bulbs:**

- 100-, 200-, 300-watt (mogul base) for floor lamps and dining room fixtures with diffusing bowls.
- 50-, 100-, 150-watt (mogul base) for small floor lamps, dinette fixtures and some table lamps.
- 50-, 100-, 150-watt (standard base) for floor, table or wall reading lamps with 2- or 3-position switches.
- 30-, 70-, 100-watt (standard base) for some dresser and dressing table lamps and some bathroom mirror fixtures.

## **Fluorescent tubes:**

- 15-watt for under-cabinet, mirror and over-range light.
- 20-watt for under-cabinet, mirror and over-range light.
- 30-watt for bed-lamp, work bench, under-cabinet lights, at long mirrors.

## **Minimum total fluorescent-tube wattages suggested by Illuminating Engineering Society for shielded ceiling fixtures:**

- 80-watt for kitchen, dining room, living room (this may be obtained by two fixtures).
- 60-watt for dinette.
- 40-watt for bedroom (also for unshielded-type laundry or milk house fixture).
- 30-watt for bathroom.

